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POL OF

August 30, 2013

Project No. 3-61M-125611

United States EPA, Region 10  
1200 Sixth Avenue, Suite 900  
Seattle, WA 98101

Attention: Ms. Jan Palumbo (AWT-121)

Subject: **Revised Source Area Investigation and Chemical Oxidation Pilot Test Work Plan**  
**J.H. Baxter & Co, Arlington Washington Facility**

Dear Ms Palumbo:

On behalf of J.H. Baxter & Co. (Baxter), AMEC Environment & Infrastructure, Inc. (AMEC) has prepared this revised Source Area Investigation and Pilot Test Work Plan (Work Plan) for the wood treating facility located at 6520 188<sup>th</sup> Street NE in Arlington, Washington ([Facility] Figure 1). Recent studies at the facility have been conducted pursuant to the Administrative Order on Consent (AOC) dated April 30, 2001.

This revised Work Plan addresses the need for additional characterization data and pilot testing to support in situ chemical oxidation (ISCO) as a potential technology, as described in the Corrective Measures Study (CMS), Revision 3, submitted to United States Environmental Protection Agency (EPA) on April 17, 2013 (AMEC, 2013), and in accordance with the U.S. Environmental Protection Agency's (EPA's) request for an investigation and chemical oxidation pilot test dated May 17, 2013.

In preparing this Work Plan, it has been assumed that public notice and public participation will not be required since the Work Plan addresses supplemental data acquisition and a pilot study to assess the selected remedial technologies and is not a plan to complete a final remedial action. All activities associated with this Work Plan will be implemented in accordance with the notification requirements of the AOC.

## PURPOSE AND OBJECTIVES

The purpose of this Work Plan is to document the investigation tasks to acquire Facility-specific data to aid in the design and implementation of a chemical oxidation pilot study. The objectives of the investigation tasks are to collect sufficient data to design a pilot test that will evaluate the effectiveness of chemical oxidation as a remedial technology in the Main Treating Area (Figure 2).

AMEC Environment & Infrastructure, Inc.  
7376 SW Durham Road  
Portland, Oregon  
USA 97224  
Tel+1 (503) 639-3400  
Fax+1 (503) 620-7892  
www.amec.com

amec

8/30/13 21 April 2014

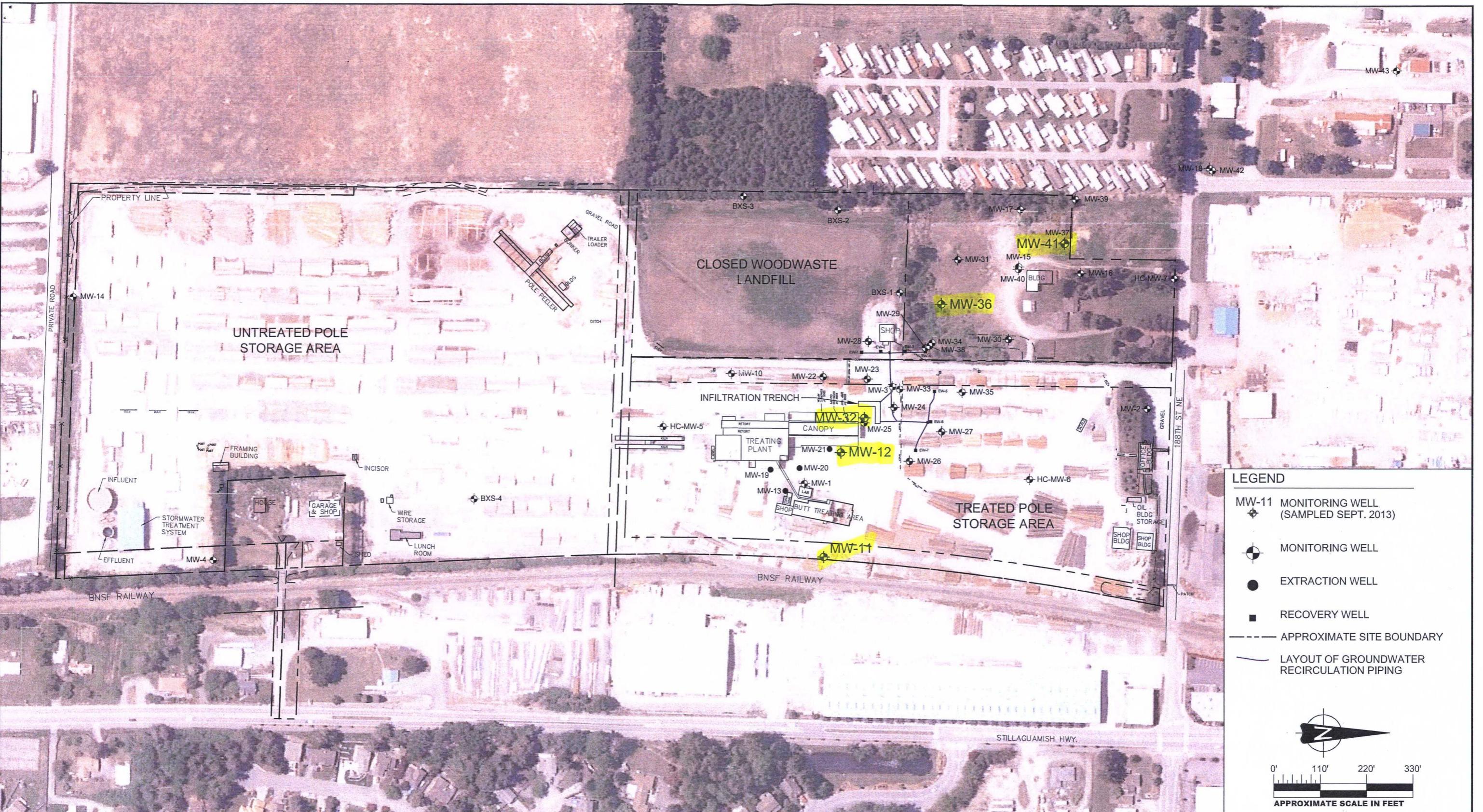
MEETING w/ STEVE,  
PATRICK, RUEANNA

& EPA  
ON DRAFT DATA  
FROM BENCH TEST  
AND REQUEST FOR  
ANOTHER PHASE.

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**Figure 6. Proposed Schedule**



AERIAL: MAY 2009, GOOGLE



CLIENT:

J.H. BAXTER

AMEC  
7376 S.W. Durham Road  
Portland, OR. U.S.A. 97224



DWN BY:

APS/SD

PROJECT:

FORMER J.H. BAXTER AND CO.  
WOOD TREATING FACILITY  
ARLINGTON, WA

DATE:

APRIL 2014

PROJECT NO.:

4-61M-125612

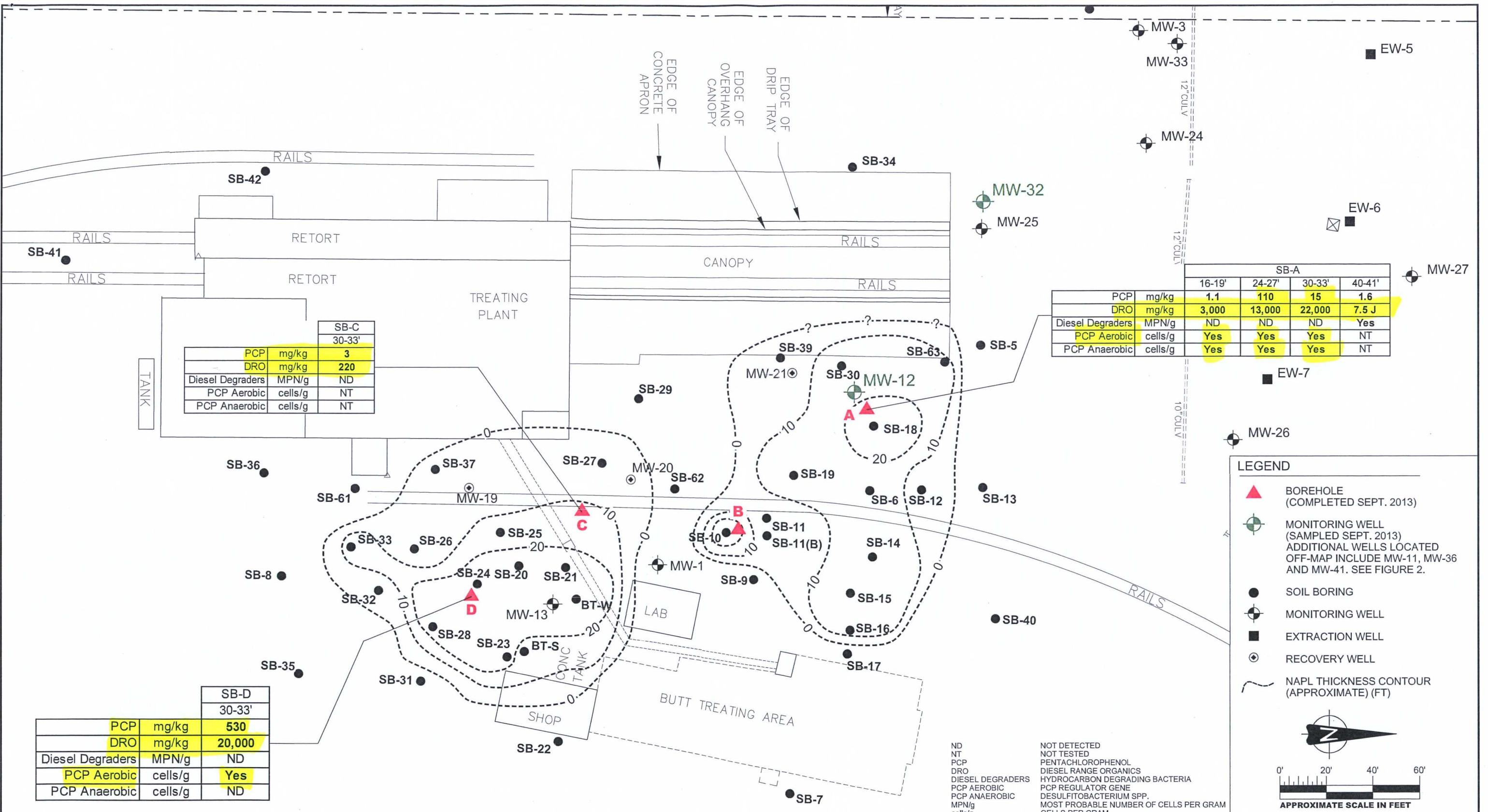
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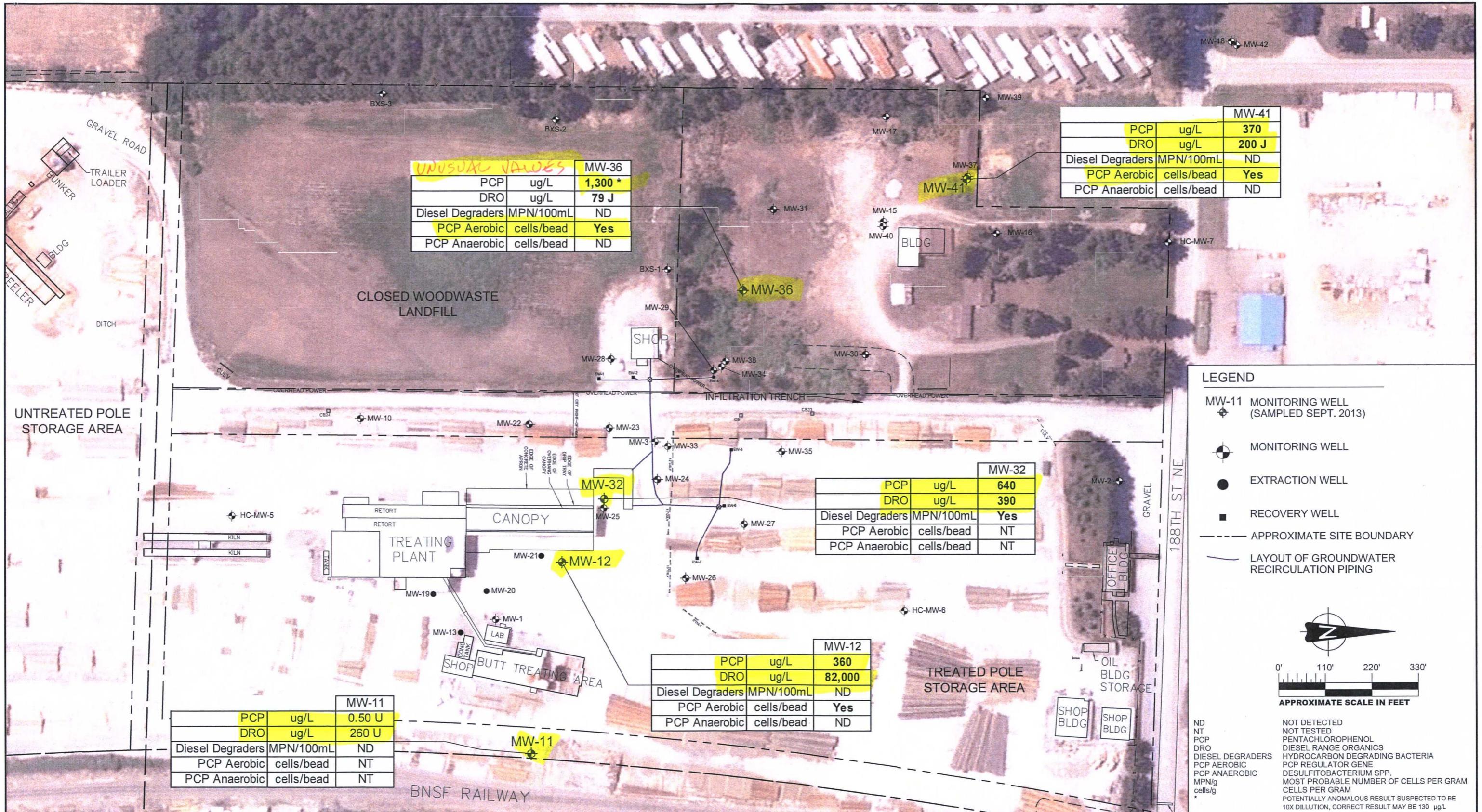
FIGURE NO.:

2

GROUNDWATER MONITORING NETWORK



<b>DRAFT</b>	  <b>J.Baxter</b>	<b>CLIENT:</b> <b>J.H. BAXTER</b>	<b>DWN BY:</b> JRS/SD <b>CHK'D BY:</b> JS <b>DATUM:</b> - <b>PROJECTION:</b> - <b>SCALE:</b> AS SHOWN	<b>PROJECT:</b> <b>FORMER J.H. BAXTER AND CO.</b> <b>WOOD TREATING FACILITY</b> <b>ARLINGTON, WA</b>	<b>DATE:</b>				
					APRIL 2014				
					PROJECT NO.:				
					4-61M-125612				
					REV. NO.:				
					A				
<b>BOREHOLE SOIL SAMPLING LOCATIONS AND RESULTS - SEPTEMBER 2013</b>					FIGURE NO.:				
					3				



AERIAL: MAY 2009, GOOGLE

CLIENT:

J.H. BAXTER

**DRAFT****J.Baxter**AMEC  
7376 S.W. Durham Road  
Portland, OR. U.S.A. 97224**amec**

DWN BY:

APS/SD

CHK'D BY:

JS

DATUM:

-

PROJECTION:

-

SCALE:

AS SHOWN

PROJECT:  
FORMER J.H. BAXTER AND CO.  
WOOD TREATING FACILITY  
ARLINGTON, WADATE:  
APRIL 2014

PROJECT NO.:

4-61M-125612

REV. NO.:

A

FIGURE NO.:

4

**Table 1a**  
**Soil Sample Collection and Analysis Summary**

Method					160.3	2320B	353.2	365.3	4500NH3E	6010B	8151M	9045	9056	ASTM D4129	ASTM D422	CENSUS	HDB	NWTPH-DX	Ursus Bench	Ursus Bench
Location	Sample ID	Sample Date	Sample Type	Matrix	Total Solids, Percent Solids	Total Alkalinity	Nitrate/Nitrite	Ortho-phosphate	Ammonia as Nitrogen	Metals	PCP	pH	Sulfate/Chloride	TOC	Grain Size	Hydro-carbon Degrading Bacteria	TPH Diesel and Residual	Total Oxidant Demand	ISCO Effectiveness Test	
SB-A	SB-A:10-11	9/21/2013	N	SO													X			
SB-A	SB-A:16-19	9/21/2013	N	SO	X	X	X	X	X	X	X	X	X	X	X	X	X			
SB-A	SB-A:24-27	9/21/2013	N	SO	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
SB-A	SB-A:30-33	9/21/2013	N	SO	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
SB-A	SB-A:40-41	9/21/2013	N	SO	X	X	X	X	X	X	X	X	X	X		X				
SB-A	SB-E:30-33	9/21/2013	FD	SO	X						X						X			
SB-C	SB-C:20-21	9/21/2013	N	SO														X		
SB-C	SB-C:30-33	9/21/2013	N	SO	X	X	X	X	X	X	X	X	X	X	X	X	X			
SB-D	SB-D:30-33	9/21/2013	N	SO	X	X	X	X	X	X	X	X	X	X	X	X	X	X		

**Table 1b**  
**Groundwater Sample Collection and Analysis Summary**

Method					2320B	300	415.1	4500NH3E	4500PE	6010B	8151M	9030	FIELD PARAM	HDB	NWTPH-DX	RSK 175	CENSUS	Ursus Bench	Ursus Bench
Location	Sample ID	Sample Date	Sample Type	Matrix	Total Alkalinity	Nitrate/Nitrite/Sulfate	TOC	Ammonia as Nitrogen	Ortho-phosphate	Metals	Chlorinated Herbicides	Total Sulfide	Field	Bacteria	TPH	Methane/Ethane/Ethene	DNA / RNA	Total Oxidant Demand	ISCO Effectiveness Test
MW-12	MW-12-BT	12/2/2013	N	BT												X			
MW-36	MW-36-BT	12/2/2013	N	BT												X			
MW-41	MW-41-BT	12/2/2013	N	BT												X			
MW-11	MW-11_20130919	9/19/2013	N	GW	X	X	X	X	X	X	X	X	X	X	X				
MW-12	MW-12_20130921	9/21/2013	N	GW	X	X	X	X	X	X	X	X	X	X	X		X		
MW-32	MW-32_20130919	9/19/2013	N	GW	X	X	X	X	X	X	X	X	X	X	X				
MW-36	MW-36_20130919	9/19/2013	N	GW	X	X	X	X	X	X	X	X	X	X	X				
MW-41	MW-41_20130919	9/19/2013	N	GW	X	X	X	X	X	X	X	X	X	X	X				
MW-44	MW-44_20130919	9/19/2013	FD	GW	X	X	X	X	X	X	X	X		X	X	X			
MW-45	MW-45_20130919	9/19/2013	EB	GW	X	X	X	X	X	X	X	X		X	X	X			

BT = Biotrap placed within groundwater well

EB = Equipment blank

FD = Field duplicate

GW = Groundwater

N = Normal samples

SO = Soil

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**TABLE 2a**  
**Soil Biogeochemical Results Summary Table**  
**September 2013 Source Investigation**  
**J.H. Baxter & Co. Arlington Facility, Washington**

Aerobic (?)aerobicaerobic

Location	Depth	Sample Date	Diesel Range Organics		Residual Range Organics		Pentachlorophenol (PCP)		Nitrate	Nitrite	Manganese	Iron	Sulfate	Total Alkalinity	Chloride	Hydrocarbon Degrading Bacteria	Dehalococcoides	Desulfitobacterium spp.	PCP Regulator Gene	PCP-4-Monoxygenase	Maleylacetate Reductase	Total Organic Carbon	Ammonia as Nitrogen	Orthophosphate	pH
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg																	
SB-A	16-19	9/21/2013	<b>3,000</b>	<b>170</b>	<b>1.1</b>	0.52 U	<b>0.12 J</b>	<b>229</b>	17,100	3.7 U	<b>83.0</b>	3.7 U	9.4 U	1,000 U	<b>6,980,000</b>	<b>12,400,000</b>	<b>640,000</b>	2,000 U	<b>2,740</b>	1.41	0.34	7.17			
SB-A	24-27	9/21/2013	<b>13,000</b>	<b>660</b>	<b>110</b>	<b>0.10 J</b>	<b>0.08 J</b>	<b>255</b>	21,100	1.3 J	<b>80.1</b>	<b>1.8 J</b>	9.6 U	1,000 U	<b>3,640,000</b>	<b>144,000</b>	2000 U	2,000 U	<b>5,330</b>	0.56	0.20	7.09			
SB-A	30-33	9/21/2013	<b>22,000</b>	<b>1200 J</b>	<b>15</b>	<b>0.27 J</b>	<b>0.06 J</b>	<b>241</b>	21,300	2.4 J	<b>626</b>	<b>1.3 J</b>	10 U	1,000 U	<b>250</b>	<b>327,000</b>	2000 U	2,000 U	<b>9,460</b>	2.01	0.19	6.94			
SB-A	40-41	9/21/2013	<b>7.5 J</b>	<b>10 J</b>	<b>1.6</b>	<b>0.12 J</b>	<b>0.03 J</b>	<b>305</b>	22,600	2.3 J	<b>530</b>	<b>1.4 J</b>	<b>12</b>	NT	NT	NT	NT	NT	990	1.64	0.69	7.06			
SB-C	30-33	9/21/2013	<b>220</b>	<b>38 J</b>	<b>3</b>	<b>0.11 J</b>	0.29 U	<b>325</b>	21,200	<b>5.6</b>	<b>601</b>	<b>9.5</b>	10 U	NT	NT	NT	NT	NT	<b>1,620</b>	1.02	0.91	7.24			
SB-D	30-33	9/21/2013	<b>20,000</b>	<b>1,500</b>	<b>530</b>	<b>0.10 J</b>	<b>0.04 J</b>	<b>264</b>	20,100	3.7 J	<b>201</b>	5.3 U	12 U	1,000 U	2,000 U	<b>1,610,000</b>	<b>78,400</b>	2,000 U	<b>9,820</b>	0.40	0.15	6.87			

**Notes:**

BOLD = detection

Results not validated

Data reported to reporting detection limit

U = not detected at or above the stated level

J = estimated result

cells/g = cells per gram

mg/kg = milligrams per kilogram

MPN/g = most probable number of cells per gram

NT = not tested

pH units = standard unit

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TABLE 2b  
Groundwater Biogeochemical Results Summary Table  
September 2013 Groundwater Investigation  
J.H. Baxter & Co. Arlington Facility, Washington

Location	Sample Date	Diesel Range Organics	Pentachlorophenol (PCP)	Tetrachlorophenols, Total	2,4,5-Trichlorophenol	Oxidation Reduction Potential	Dissolved Oxygen	Nitrate	Nitrite	Manganese	Iron	Ferrous Iron	Sulfate	Total Sulfide	Total Alkalinity	MPN/100mL	Hydrocarbon Degrading Bacteria	Dehalococcoides	Desulfitobacterium spp.	PCP Regulator Gene	PCP-4-Monoxygenase	Maleylacetate Reductase	Total Organic Carbon	Ammonia as Nitrogen	Orthophosphate	pH
		ug/L	ug/L	ug/L	ug/L	mV	mg/L	mg/L	mg/L	ug/L	ug/L	mg/L	ug/L	mg/L	ug/L	mg/L	cells/bead	cells/bead	cells/bead	cells/bead	cells/bead	cells/bead	mg/L	mg/L	mg/L	pH units
MW-11	9/19/2013	260 U	0.50 U	1.0 U	1.0 U	255.7	3.15	0.21	0.10 U	5.3	136	0.0 U	4.35	0.10 U	1.3 U	73.7	2.64	900 U	NT	NT	NT	NT	1.12	0.035 J	0.050 U	6.32
MW-12	9/21/2013	82,000	360	12	0.34 J	-33.0	0.71	0.10 U	0.10 U	1,720	2,920	3.0	7.35	0.10 U	28	89.4	2.97	900 U	NT	NT	NT	NT	3.46	0.152	0.050 U	5.66
MW-12	12/2/2013	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	25 U	250 U	30,500	795	1,870	NT	NT	NT	NT	
MW-32	9/19/2013	390	640	38 U	1.0 U	200.4	0.35	0.36	0.03 J	25.0	913	0.0 U	8.53	0.10 U	1.3 U	56.2	6.54	13,500	NT	NT	NT	NT	1.41	0.044 J	0.050 U	5.87
MW-36	9/19/2013	79 J	1300 *	1.0 U	1.0 U	212.9	0.24	0.12	0.10 U	626	20.0 U	NT	12.1	0.10 U	1.3 U	143	8.12	900 U	NT	NT	NT	NT	2.38	0.013 J	0.050 U	6.23
MW-36	12/2/2013	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	25 U	250 U	16,400	5,440	7,710	NT	NT	NT	NT
MW-41	9/19/2013	200 J	370	9.7 U	1.0 U	245.0	0.18	0.14	0.10 U	68.9	20.0 U	0.0 U	14.2	0.10 U	15	65.2	7.01	900 U	NT	NT	NT	NT	1.53	0.036 J	0.050 U	5.78
MW-41	12/2/2013	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	25 U	250 U	14,600	1,890	3,070	NT	NT	NT	NT

## Notes:

BOLD = detection

Results not validated

Data reported to reporting detection limit

U = not detected at or above the stated level

J = estimated result

cells/bead = cells per bead

deg C = celsius

pH units = standard unit

mg/L = milligrams per liter

MPN/mL = most probable number of cells per milliliter

ms/cm = milli-Siemens per centimeter

mV = millivolts

NT = not tested

µg/L = micrograms per liter

\* Potentially anomalous result suspected to be 10X dilution, correct result may be 130 µg/L

## DRAFT

**Table 3**  
**Samples Submitted to Ursus for ISCO Bench Study**

Sample ID	Sample Type	Zone at Time of Drilling	OVM reading (ppmV)	Sheen, Product Droplets, Free Product Visible?	Diesel Range Organics	Penta-chlorophenol
SB-A: 10-11	Woody Debris w/ Sand	Vadose	2.1	No	NA	NA
SB-A: 16-19	Sand w/ Gravel	Vadose	15.6	Sheen/ Droplets	3,000 mg/kg	1.1 mg/kg
SB-A: 24-27	Sand w/ Gravel	Vadose	16.0	Sheen/ Droplets	13,000 mg/kg	110 mg/kg
SB-A: 30-33	Sand w/ Silt & Gravel	Saturated	22.8	Free Product	22,000 mg/kg	15 mg/kg
SB-C: 20-21	Sand w/ Gravel	Vadose	2.3	No	NA	NA
SB-D: 30-33	Sand w/ Silt	Saturated	17.7	Sheen/ Droplets/ Free Product	20,000 mg/kg	530 mg/kg
MW-12	Source Are Groundwater	Saturated	NA	Free Product	82 mg/L	0.36 mg/L

mg/kg – milligrams per kilogram

mg/L – milligrams per liter

OVM – Organic Vapor Monitor

ppmV – parts per million volume



AMEC - JH Baxter TOD/Residual Oxidant/Metals Summary

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All Constituents		TOD/Residual Oxidant/Dissolved Metals DRO/PCP																														
		Day 22					Day 49					Day 78					Day 102															
Sample ID	Dosage g/kg	pH	TOD, g/kg	Residual Oxidant, g/kg	Dosage g/kg	pH	TOD, g/kg	Residual Oxidant, g/kg	As, mg/L	Cr (total), mg/L	Cu, mg/L	Pb, mg/L	Diesel Range Organics, mg/kg	Diesel Range Organics, % Reduction	Penta-chlorophenol, mg/kg	Penta-chlorophenol, % Reduction	Dosage g/kg	pH	TOD, g/kg	Residual Oxidant, g/kg	Dosage g/kg	pH	TOD, g/kg	Residual Oxidant, g/kg	As, mg/L	Cr (total), mg/L	Cu, mg/L	Pb, mg/L	Diesel Range Organics, mg/kg	Diesel Range Organics, % Reduction	Penta-chlorophenol, mg/kg	Penta-chlorophenol, % Reduction
SB-D-30-33 - Control	NA	NA	NA	NA	NA	NA	NA	NA	<0.30	<0.050	<0.050	<0.30	12,000	-	190	-	NA	6.30	NA	NA	NA	NA	NA	<0.30	<0.050	<0.050	<0.30	13,000	-	130	-	
SB-D-30-33 - Alk Pers	23.0	10.30	19.9	3.1	46.0	12.19	39.2	6.8	0.94	0.92	0.060	<0.30	11,000	8%	5.8	97%	46.0	10.64	38.7	7.3	69.0	12.87	58.5	10.5	0.80	0.90	<0.050	<0.30	9,700	25%	4.6	96%
	46.0	13.49	35.6	10.4	92.0	12.75	55.9	36.1	1.14	1.94	0.073	<0.30	12,000	0%	4.8	97%	92.0	12.90	52.7	39.3	115.0	13.13	59.5	55.5	0.90	1.17	<0.050	<0.30	13,000	20%	<3.8	>97%
SB-D-30-33 - H2O2/Pers	23.0	3.50	19.1	3.9	46.0	2.45	37.9	8.1	<0.30	0.36	1.44	<0.30	11,000	8%	110	42%	46.0	2.47	37.4	8.6	69.0	2.43	56.6	12.4	<0.30	1.04	2.21	<0.30	11,000	15%	51	61%
	46.0	2.70	26.7	19.3	92.0	2.18	50.7	41.3	<0.30	1.07	2.92	<0.30	8,600	28%	150	21%	92.0	2.38	47.9	44.1	115.0	2.33	52.3	62.7	<0.30	1.64	2.87	0.41	5,200	60%	27	79%
SB-D-30-33 - Fe Pers	23.0	2.66	19.2	3.8	46.0	2.40	38.1	7.9	<0.30	0.34	1.60	<0.30	13,000	-8%	80	58%	46.0	2.42	37.4	8.6	69.0	2.35	56.8	12.2	<0.30	0.81	2.10	<0.30	8,200	37%	63	52%
	46.0	2.42	26.4	19.6	92.0	2.18	51.7	40.3	<0.30	0.66	2.52	0.31	8,000	33%	48	75%	92.0	2.29	47.5	44.5	115.0	2.27	52.7	62.3	<0.30	1.26	2.61	<0.30	5,000	62%	30	77%
SB-D-30-33 - Na-Perm	23.0	NA	6.6	16.4	23.0	NA	11.5	11.5	<3.0	3.50	1.14	<3.0	15,000	-25%	58	69%	23.0	8.96	>23.0	0.0	69.0	8.89	39.1	29.9	0.33	2.23	<0.050	0.93	6,400	51%	31	76%
SB-A-24-27 - Control	NA	NA	NA	NA	NA	NA	NA	NA	<0.30	<0.050	0.10	<0.30	7,200	-	45	-	NA	5.71	NA	NA	NA	NA	NA	<0.30	<0.050	0.10	<0.30	3,400	-	31	-	
SB-A-24-27 - Alk Pers	43.8	11.59	36.6	7.1	87.5	12.69	57.6	29.9	1.43	2.96	0.061	<0.30	9,200	-28%	3.6	98%	131.3	12.96	78.8	52.5	175	13.12	110	64.9	1.01	2.17	<0.050	<0.30	3,400	0%	<3.8	>88%
	87.5	11.16	77.7	9.8	175	12.82	137	38.1	1.48	3.12	0.064	0.31	11,000	-53%	2.2	99%	262.5	12.97	205.3	57.2	350	13.05	278	72.3	1.50	3.00	<0.050	<0.30	4,700	-38%	<4.7	>85%
SB-A-24-27 - H2O2 Pers	43.8	3.45	27.5	16.3	87.5	2.07	49.8	37.7	<0.30	1.32	3.03	0.033	7,600	-6%	14	93%	131.3	2.62	64.2	67.1	175	2.10	92.5	82.5	0.32	2.53	4.00	0.51	2,700	21%	7.3	76%
	87.5	2.68	68.0	19.5	175	1.87	135	40.0	<0.30	2.21	3.81	0.45	6,200	14%	12	94%	262.5	2.29	195.7	66.8	350	1.82	269	80.8	0.74	4.94	6.80	0.69	3,100	9%	7.4	76%
SB-A-24-27 - Fe Pers	43.8	2.72	27.5	16.2	87.5	2.03	48.0	39.5	<0.30	1.31	2.89	<0.30	6,100	15%	11	94%	131.3	2.43	65.1	66.2	175	2.05	92.0	83.0	0.37	2.29	3.81	0.47	2,600	24%	8.6	72%
	87.5	2.56	68.4	19.1	175	1.94	134	41.1	<0.30	1.29	2.94	<0.30	6,100	15%	13	93%	262.5	2.30	196.3	66.2	350	1.74	266	83.7	0.79	4.07	5.91	0.53	2,800	18%	11	65%
SB-A-24-27 - Na Perm	43.8	NA	31.3	12.5	43.8	NA	41.3	2.5	<3.0	13.2	1.08	<3.0	7,200	0%	4.8	97%	43.8	8.81	>43.8	0.0	87.6	8.77	29.6	58.0	0.65	4.14	<0.050	1.73	2,800	18%	<3.3	>89%

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Diesel and PCP only

Sample ID	Day 49						Day 102				
	Dosage g/kg	Diesel Range Organics, mg/kg	Diesel Range Organics, % Reduction	Penta-chloro-phenol, mg/kg	Penta-chloro-phenol, % Reduction		Dosage g/kg	Diesel Range Organics, mg/kg	Diesel Range Organics, % Reduction	Penta-chloro-phenol, mg/kg	Penta-chloro-phenol, % Reduction
SB-D-30-33 - Control	NA	12,000	-	190	-		NA	13,000	-	130	-
SB-D-30-33 - Alk Pers	46.0	11,000	8%	5.8	97%		69.0	9,700	25%	4.6	96%
	92.0	12,000	0%	4.8	97%		115.0	13,000	0%	<3.8	>97%
SB-D-30-33 - H2O2/Pers	46.0	11,000	8%	110	42%		69.0	11,000	15%	51	61%
	92.0	8,600	28%	150	21%		115.0	5,200	60%	27	79%
SB-D-30-33 - Fe Pers	46.0	13,000	-8%	80	58%		69.0	8,200	37%	63	52%
	92.0	8,000	33%	48	75%		115.0	5,000	62%	30	77%
SB-D-30-33 - Na-Perm	23.0	15,000	-25%	58	69%		69.0	6,400	51%	31	76%
SB-A-24-27 - Control	NA	7,200	-	45	-		NA	3,400	-	31	-
SB-A-24-27 - Alk Pers	87.5	9,200	-28%	3.6	92%		175	3,400	0%	<3.8	>88%
	175	11,000	-53%	2.2	95%		350	4,700	-38%	<4.7	>85%
SB-A-24-27 - H2O2 Pers	87.5	7,600	-6%	14	69%		175	2,700	21%	7.3	76%
	175	6,200	14%	12	73%		350	3,100	9%	7.4	76%
SB-A-24-27 - Fe Pers	87.5	6,100	15%	11	76%		175	2,600	24%	8.6	72%
	175	6,100	15%	13	71%		350	2,800	18%	11	65%
SB-A-24-27 - Na Perm	43.8	7,200	0%	4.8	89%		87.6	2,800	18%	<3.3	>89%